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Update on Marijuana

ABSTRACT

Marijuana, the illicit drug most widely used by adolescents, is not a benign substance. Inhalation of marijuana smoke is more harmful than tobacco smoke; cannabis smoke delivers 50% to 70% more carcinogens. Other physiological effects include decreased immune function, higher rates of cardiac arrhythmias, and documented cases of cerebellar infarction. Mood and cognitive effects of marijuana include exacerbation of

depression and anxiety (including panic attacks), as well as memory problems that may persist for a month after last use. Cannabis abuse is a risk factor for psychosis in genetically predisposed people and may lead to a worse outcome of schizophrenia. The cumulative respiratory, cardiovascular, metabolic, and mental health risks of marijuana are significant and should be emphasized by nurses who work with adolescents.

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During the course of a follow-up appointment at a mental health clinic, Trent, a 17-year-old boy, was found to have lost approximately 26 pounds in the 3-month period after hospitalization for psychotic symptoms. Before the nurse practitioner congratulated herself for having been such an excellent clinician for motivating his weight reduction, she asked Trent, “What’s your secret for weight loss?”

The answer surprised the nurse, but it should not have: Trent explained that he had quit using marijuana, the most frequently used illicit drug among U.S. adolescents (Substance Abuse and Mental Health Services Administration [SAMHSA], 2007). Marijuana (also known as *cannabis sativa* or cannabis), with its appetite-stimulating effects, had contributed to Trent’s obesity.

At the time of his hospitalization 3 months earlier, Trent’s initial body mass index (BMI) was 42.5 and was accompanied by dyslipidemia, impaired fasting glucose, and an elevated blood pressure of 160/90. Approximately 90 days later, his BMI had decreased by 3.6 points, driven by his 26-pound weight loss. So why did Trent quit the marijuana? Unfortunately, it was not because of the salutary benefits of not smoking; rather, the young man had a brother who was caught selling the drug. Trent, as a minor, was found to have cannabis in his possession. During the court proceedings, the judge ordered that both Trent and his brother be subjected to random drug testing. Both had quit smoking cannabis. In the space of just 3 months, Trent was 26 pounds lighter. This significant weight

loss gives reason to pause and ask: Did his cannabis use play a large role in his hospital admission, and are health care professionals cognizant of the significant role cannabis plays in the health of adolescents?

AN OVERVIEW OF CANNABIS

Cannabis consists of the dried leaves, stems, and seeds of the hemp plant and has been used for religious and medicinal purposes for more than 1,000 years. It is ingested via multiple routes but is most commonly

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smoked. Cannabis cigarettes are also called *joints*, *nails*, and *reefers*; pipes for smoking are also known as *bongs* and *bowls* (Neuspiel, 2007). Cannabis may also be incorporated into food items or brewed as tea. A powerful resin of cannabis (hashish) is usually smoked in pipes or in cigarette form; its potency may vary due to its cultivation. Cannabis’s active ingredient is THC (delta-9-tetrahydrocannabinol) and due to creative agriculture, the THC content of cannabis has more than quadrupled from 0.5% to 2.0% in the 1970s to 6% to 10% in 2000 (Neuspiel, 2007).

Use of cannabis is widespread, with increasing rates of use as adolescents approach adulthood. Admitted lifetime use among 10th and 12th graders was 34.1% and 44.8%, respectively; daily use of cannabis was 3.1% and 5%, respectively (Johnston, O’Malley, Bachman, & Schulenberg, 2009). When smoked, THC passes quickly from the respiratory tract to the bloodstream and finds its way to the brain, binding to cannabinoid receptors. Within minutes, the active component of the drug changes brain chemistry and peaks 15 to 30 minutes later. The effect lasts 2 to 3 hours (Grotenhermen, 2003). THC is lipid soluble with a serum half-life of approximately 19 hours (Neuspiel, 2007).

Physiological Effects

The inhalation of cannabis smoke carries significant health risks. In the pulmonary system, cannabis use is more harmful than tobacco use. Cannabis smoke delivers 50% to 70% more carcinogenic hydrocarbons as compared with tobacco smoke, and the effects of these agents are magnified by deeper and longer inhalations (Neuspiel, 2007). People who smoke cannabis regularly often experience similar consequences as tobacco smokers, such as frequent cough, respiratory infections, higher rates of asthma, as well as increased risk of lung cancer (Neuspiel, 2007). Chronic bronchitis, reduced lung density, and lung cysts have also been linked to cannabis use in a dosage-dependent manner (Reece, 2009).

Other physiological effects of inhaling cannabis smoke are also harmful:

- Blood pressure variability, which may be accompanied by

orthostatic changes (Grotenhermen, 2007).

- Decreased immune function (Massi, Vaccani, & Parolaro, 2006).
- Higher rates of cardiac arrhythmias (Reece, 2009).
- Reduced sperm count and irregular ovulation (Neuspiel, 2007).

An especially serious risk associated with acute cannabis use is cerebellar infarction. Geller, Loftis, and Brink (2004) described three male adolescents who experienced ischemic cerebellar strokes after cannabis use. All three experienced headache, fluctuating levels of consciousness, lethargy, ataxia, and visual disturbances; within days, all had developed cerebellar infarctions that were not attributable to other causes (Geller et al., 2004). Cerebellar and cerebral edema caused deaths in two of the boys. The third young man survived and ultimately recovered but was left with mild, right-sided dysidiadochokinesia (inability to perform rapid, alternating movements) (Geller et al., 2004).

Mood and Cognitive Effects

In addition to euphoria, behavioral changes attributed to cannabis may include:

- Exacerbation of the symptoms of depression and anxiety, including panic attacks (Grotenhermen, 2003).
- An amotivational syndrome that affects cognition, interpersonal skills, and employment.
- Memory problems that may persist for up to a month after last use (Neuspiel, 2007).

Chronic use is associated with higher risk for psychosis and dependence (Grotenhermen, 2007).

Ongoing research focusing on the chronic, heavy use of can-

nabis and the developing adolescent brain reveals some interesting findings. One study of heavy cannabis use during adolescence found (via functional magnetic resonance imaging [fMRI]) that neurodevelopment may be altered in adolescents who have a history of heavy cannabis use (Schweinsburg, Nagel, et al., 2008). A group of 15 adolescents who had used cannabis weekly for 4 years were compared with a group of 17 demographically similar adolescents who did not use cannabis. At the beginning of the study, both groups performed

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similarly on a test of spatial working memory, but adolescents using cannabis demonstrated lower activity in the prefrontal and occipital cortices, as well as higher levels of depressive symptoms and anxiety. After 1 month of abstinence from cannabis, both groups were retested and again performed similarly. However, the diminished brain activity noted by the fMRI persisted in cannabis users, even after 1 month of abstinence. Several important anatomical brain changes for chronic cannabis users have also been noted by other researchers: grey and white matter density

changes (Matochik, Eldreth, Cadet, & Bolla, 2005), reduction of 12% of volume of the hippocampus (integral to memory and spatial navigation) (Yücel, Lubman, Solowij, & Brewer, 2007), and 7% decrease in size of the amygdala (fundamental to memory of emotional reactions) (Yücel et al., 2007).

In a review of cannabis and its overall impact on cognition, Schweinsburg, Brown, and Tapert (2008) concluded that individuals who use cannabis heavily during adolescence may experience persistent neurocognitive abnormalities, which could have significant negative implications for cognitive abilities during adulthood. In addition, Schweinsburg, Brown, et al. (2008) reported that adults who had used cannabis in early adolescence showed greater cognitive difficulties than those who began use later; they concluded that adolescents are more vulnerable than adults with respect to neurocognitive abnormalities associated with heavy cannabis use.

Perhaps the most alarming issue for psychiatric nurses is that cannabis is associated with the onset of symptoms of schizophrenia. Cannabis abuse is a risk factor for psychosis in genetically predisposed people and may lead to a worse outcome of schizophrenia (Fergusson, Poulton, Smith, & Boden, 2006). The epidemiological evidence is strong. The association was first noticed in a prospective study of 45,000 Swedish military recruits that began in 1969; 15 years later, those who had used cannabis were significantly more likely to have been diagnosed with schizophrenia (Andréasson, Allebeck, Engström, & Rydberg, 1987). Other cohorts have also been studied in several countries, and all studies

found that cannabis use is associated with subsequent diagnoses of psychotic disorders (Fergusson et al., 2006). Perhaps the underlying mechanism is the higher density of cannabinoid receptors present in the brains of people with schizophrenia; using cannabis may dysregulate the receptors in such a way that neurotransmitters are affected, producing psychotic symptoms (Fernandez-Espejo, Viveros, Núñez, Ellenbroek, & Rodriguez de Fonseca, 2009).

NURSING IMPLICATIONS

Nurses should always assess for the presence of substance use with youth. Cannabis is the number one illicit substance used by adolescents (SAMHSA, 2007), and its use is widespread. Treatment admissions for primary cannabis dependence have increased from 7% to 16% nationwide in the past 10 years (Budney, Roffman, Stephens, & Walker, 2007). With the increasing presence of cannabis, psychiatric nurses should strive to teach both adolescents and their families that cannabis is not a benign substance. Indeed, it is associated with respiratory, cardiovascular, metabolic, and mental health risks.

Nurses can direct patients and their families to the National Institute on Drug Abuse (NIDA) Web site (<http://www.nida.nih.gov>) which has information for youth, parents, teachers, and clinicians. Specifically, NIDA has a Web site for adolescents with personal stories and education targeted to maintain adolescents' interests within an online learning environment (<http://teens.drugabuse.gov/index.php>). Don't miss Sara Bellum's (pun

intended) blog; Sara explains the science of addiction in an interesting manner and answers important questions such as, Does inhaling a permanent marker make you high? The Web address is <http://teens.drugabuse.gov/blog>.

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